

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: TROY J. COLE
WOODARD, EMHARDT, NAUGHTON, MORIARTY
& MCNETT
BANK ONE CENTER/TOWER, SUITE 3700
111 MONUMENT CIRCLE
INDIANAPOLIS, INDIANA 46204

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

Date of Mailing
(day/month/year)

05 APR 2000

Applicant's or agent's file reference

503ID2116

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.

PCT/US99/29395

International filing date
(day/month/year)

10 DECEMBER 1999

Applicant

CUMMINS ENGINE COMPANY, INC.

G.S.O.C.

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the international search report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in rules 90 bis 1 and 90 bis 3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

F. DANIEL LOPEZ

Diane Smith f

Telephone No. (703) 308-0008

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 503ID2116	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5
International application No. PCT/US99/29395	International filing date (day/month/year) 10 DECEMBER 1999	(Earliest) Priority Date (day/month/year) 11 DECEMBER 1998
Applicant CUMMINS ENGINE COMPANY, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).
2. ☐ Unity of invention is lacking (See Box II).
3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
 - ☐ filed with the international application.
 - ☐ furnished by the applicant separately from the international application,
 - ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
 - ☐ transcribed by this Authority.
4. With regard to the title,
 - ☒ the text is approved as submitted by the applicant.
 - ☐ the text has been established by this Authority to read as follows:
5. With regard to the abstract,
 - ☐ the text is approved as submitted by the applicant.
 - ☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:
Figure No. 10, 11A
 - ☐ as suggested by the applicant.
 - ☐ because the applicant failed to suggest a figure.
 - ☒ because this figure better characterizes the invention.

☐ None of the figures.

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The technical features mentioned in the abstract do not include a reference sign between parentheses (PCT Rule 8.1(d)).

NEW ABSTRACT

An engine cylinder piston connecting rod subassembly, for use in an engine, includes a piston (53), a piston pin (52) and a connecting rod (51). The connecting rod has a piston end portion with a piston pin bore (62). The piston pin is inserted through the piston pin bore and oppositely disposed portions of the piston, for securing the piston and the connecting rod together. Opposite ends of the piston pin bore are machined or profiled with relief portions (60, 61), to allow for piston pin deflection and thereby maximize the load carrying capacity, by providing a greater area of contact. The relief portions can be a curved surface (65) machined as part of the bore, or a plurality of end-to-end angled frustoconical surfaces (66a, 66b, 66c). The relief portions are shaped to correspond to the shape of the corresponding piston pin when under load during normal engine operation.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29395

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : F16J 1/16
US CL : 92/187, 222

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 92/187, 222

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,291,614 A (MOLLE ET AL) 29 SEPTEMBER 1981, ENTIRE DOCUMENT	1-10
Y	US 3,161,185 A (JUSTINIEN ET AL) 15 DECEMBER 1964, ENTIRE DOCUMENT	1-10
Y	US 2,703,264 A (PITNER) 01 MARCH 1955, ENTIRE DOCUMENT	1-10
Y	US 3,994,054 A (CUDDON-FLETCHER ET AL) 30 NOVEMBER 1976, ENTIRE DOCUMENT	4, 9
Y	TOOL ENGINEERS HANDBOOK, 1949, MCGRAW-HILL BOOK COMPANY, PAGES 1228-1229	3, 5, 8, 10
A	US 5,628,577 A (RIBEIRO ET AL) 13 MAY 1997, ENTIRE DOCUMENT	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

13 MARCH 2000

Date of mailing of the international search report

05 APR 2000

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

F. DANIEL LOPEZ

Telephone No. (703) 308-0008

PATENT COOPERATION TREATY

15 JUNE 2000

PCT

From the INTERNATIONAL BUREAU

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

COLE, Troy, J.
Woodard, Emhardt, Naughton,
Moriarty & McNett
Suite 3700
Bank One Center/Tower
111 Monument Circle
Indianapolis, IN 46204
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 15 June 2000 (15.06.00)		IMPORTANT NOTICE	
Applicant's or agent's file reference 503ID2116			
International application No. PCT/US99/29395	International filing date (day/month/year) 10 December 1999 (10.12.99)	Priority date (day/month/year) 11 December 1998 (11.12.98)	
Applicant CUMMINS ENGINE COMPANY, INC. et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

BR,EP,MX

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
15 June 2000 (15.06.00) under No. WO 00/34696

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. (41-22) 740.14.35</p>	<p>Authorized officer J. Zahra</p> <p>Telephone No. (41-22) 338.83.38</p>
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PATENT COOPERATION TREATY

PCT

INFORMATION CONCERNING ELECTED
OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

From the INTERNATIONAL BUREAU

To:

COLE, Troy, J.
Woodard, Emhardt, Naughton,
Moriarty & McNett
Suite 3700
Bank One Center/Tower
111 Monument Circle
Indianapolis, IN 46204
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 24 August 2000 (24.08.00)		
Applicant's or agent's file reference 503ID2116		IMPORTANT INFORMATION
International application No. PCT/US99/29395	International filing date (day/month/year) 10 December 1999 (10.12.99)	
Priority date (day/month/year) 11 December 1998 (11.12.98)		
Applicant CUMMINS ENGINE COMPANY, INC. et al		

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
National : BR, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

National : MX

3. The applicant is reminded that he must enter the "national phase" **before the expiration of 30 months from the priority date** before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed **until 31 months from the priority date** for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer: Henrik Nyberg Telephone No. (41-22) 338.83.38
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RECEIVED

JUN 14 2000

Woodard, Emhardt, Naughton,
Moriarty & McNett

PATENT COOPERATION TREATY

PCT

**NOTIFICATION CONCERNING
THE FILING OF AMENDMENTS OF THE CLAIMS**
(PCT Administrative Instructions, Section 417)

From the INTERNATIONAL BUREAU

To:

COLE, Troy, J.
Woodard, Emhardt, Naughton,
Moriarty & McNett
Suite 3700
Bank One Center/Tower
111 Monument Circle
Indianapolis, IN 46204
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 31 May 2000 (31.05.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 503ID2116	
International application No. PCT/US99/29395	International filing date (day/month/year) 10 December 1999 (10.12.99)
Applicant CUMMINS ENGINE COMPANY, INC. et al	


1. The applicant is hereby notified that amendments to the claims under Article 19 were received by the International Bureau on:

29 May 2000 (29.05.00)

2. This date is within the time limit under Rule 46.1.

Consequently, the international publication of the international application will contain the amended claims according to Rule 48.2(f), (h) and (i).

3. The applicant is reminded that the international application (description, claims and drawings) may be amended during the international preliminary examination under Chapter II, according to Article 34, and in any case, before each of the designated Offices, according to Article 28 and Rule 52, or before each of the elected Offices, according to Article 41 and Rule 78.

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorised officer</p> <p>Jocelyne Rey-Millet</p> <p>Telephone No.: (41-22) 338.83.38</p> 
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PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:
TROY J. COLE
WOODARD, EMHARDT, NAUGHTON, MORIARTY &
MCNETT; BANK ONE CENTER/TOWER
111 MONUMENT CIRCLE, SUITE 3700
INDIANAPOLIS, IN 46204

PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing (day/month/year)	07 MAY 2001
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Applicant's or agent's file reference

5031D2116

IMPORTANT NOTIFICATION

International application No.

PCT/US99/29395

International filing date (day/month/year)

10 December 1999 (10.12.1999)

Priority date (day/month/year)

11 December 1998 (11.12.1998)

Applicant

CUMMINS ENGINE COMPANY INC.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US

Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

F. Daniel Lopez

Telephone No. (703) 308-0861

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 503ID2116	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/29395	International filing date (day/month/year) 10 December 1999 (10.12.1999)	Priority date (day/month/year) 11 December 1998 (11.12.1998)
International Patent Classification (IPC) or national classification and IPC IPC(7): F16J 1/16 and US Cl.: 92/187, 222		
Applicant CUMMINS ENGINE COMPANY INC.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>2</u> sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>3</u> sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input checked="" type="checkbox"/> Non-establishment of report with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input checked="" type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 20 June 2000 (20.06.2000)	Date of completion of this report 24 April 2001 (24.04.2001)	
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer <i>F. Daniel Lopez</i> F. Daniel Lopez Telephone No. (703) 308-0861	

Form PCT/IPEA/409 (cover sheet)(July 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/29395

I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed.
- ☒ the description:
 pages 1-11 as originally filed
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____.
- ☒ the claims:
 pages 12, as originally filed
 pages 13-13/2, as amended (together with any statement) under Article 19
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____.
- ☒ the drawings:
 pages 1-8, as originally filed
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____.
- ☐ the sequence listing part of the description:
 pages NONE, as originally filed
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____.

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages NONE
- ☐ the claims, Nos. NONE
- ☐ the drawings, sheets/fig NONE

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/29395

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The question whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been and will not be examined in respect of:

- ☐ the entire international application,
☒ claims Nos. 11-25

because:

- ☐ the said international application, or the said claim Nos. _____ relate to the following subject matter which does not require international preliminary examination (*specify*):

- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. _____ are so unclear that no meaningful opinion could be formed (*specify*):

- ☐ the claims, or said claims Nos. _____ are so inadequately supported by the description that no meaningful opinion could be formed.

- ☒ no international search report has been established for said claims Nos. 11-25

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

- ☐ the written form has not been furnished or does not comply with the standard.
☐ the computer readable form has not been furnished or does not comply with the standard.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/29395

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. STATEMENT

Novelty (N)	Claims <u>2-5, 7-10</u>	YES
	Claims <u>1, 6</u>	NO
Inventive Step (IS)	Claims <u>4, 5, 9, 10</u>	YES
	Claims <u>1-3, 6-8</u>	NO
Industrial Applicability (IA)	Claims <u>1-10</u>	YES
	Claims <u>NONE</u>	NO

2. CITATIONS AND EXPLANATIONS (Rule 70.7)

Please See Continuation Sheet

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/29395

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

Claim 1 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because the claim is indefinite for the following reason(s): in line 10 "a piston pin" should be --said piston pin--, since it refers back to that of line 5.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US99/29395**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Claims 1 and 6 lack novelty under PCT Article 33(2) as being anticipated by Cuddon-Fletcher et al. Cuddon-Fletcher et al discloses a frustoconical profiled relief portion at each end of a connecting rod bore (for assisting in aligning and sliding a piston pin through)

Claims 1, 2, 6 and 7 do not meet an inventive step under PCT Article 33(3) as being obvious over Dreisin in view of Rosen et al and Pitner. Dreisin discloses an engine cylinder piston-connecting rod sub-assembly comprising a connecting rod (6) having a piston end portion assembled into a piston (4) and defining a connecting rod bore, extending between opposite first and second ends, for receiving a piston pin (7); wherein the piston pin is inserted through the connecting rod bore and portions of the piston for securing the piston to the connecting rod; and wherein the piston pin rotates relative to the connecting rod bore (e.g. column 2 line 31-33); but does not disclose that the connecting rod bore is shaped with first and second profiled relief portions adjacent respective first and second ends, each profiled relief portion has a curved surface.

Rosen et al teaches, for an engine cylinder piston- connecting rod sub-assembly comprising a connecting rod (14) having a piston end portion assembled into a piston (10, 11) and defining a connecting rod bore, extending between opposite first and second ends; for receiving a piston pin (13); wherein the piston pin is inserted through the connecting rod bore and bores in portions (e.g. 12) of the piston for securing the piston to the connecting rod; wherein each of the bores in the piston has a first end; that the first ends of each of the bores of the piston has a profiled relief portion (44), for the purpose of eliminating stress concentrations at the first end of each of the piston bores caused by deformation of the piston pin (e.g. column 3 line 59-64).

Pitner teaches, for a piston-connecting rod sub-assembly comprising a connecting rod (5) having a piston end portion assembled into a piston (2) and defining a connecting rod bore (e.g. 15); and a piston pin (3) inserted through the connecting rod bore and bores in portions of the piston for securing the piston to the connecting rod, with a bearing between either the bore and piston pin or a bearing between each of the piston bores and the piston pin; that there is a space between one of the bores and an adjacent portion of the pin, which form first and second profiled curved relief portions adjacent respective first and second ends of the one bore; for the purpose of accommodating deviations of the piston pin under normal load, such that the load is spread out over the full bore and not concentrated at the first and second ends (e.g. column 1 line 31-38, 61-68); that the profiled relief portions are between the piston pin and the piston bores when the piston pin rotates relative to the piston bores and is between the piston pin and connecting rod bore when the piston pin rotates relative to the connecting rod bore (column 2 line 14-24); and that the first and second profiled relief portions can be formed in either the piston pin or the bearing.

Since Rosen et al teaches that stress concentrations are a problem for a bore, which accepts a piston pin which deforms under normal load; since Pitner teaches that piston pin deformation is a problem between the piston pin and either the connecting rod bore or the piston bores, depending on relative rotational movement between the piston pin and the associated bore; and since the piston pin of Dreisin rotates with respect to the connecting rod bore; it would have been obvious at the time the invention was made to one having ordinary skill in the art to shape the connecting rod bore of Dreisin with relief portions adjacent each of the first and second ends, as taught by Pitner and Rosen et al, for the purpose of having the relief portions eliminate stress concentrations caused by deformation of the piston pin under normal load.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US99/29395

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

It would have been obvious at the time the invention was made to one having ordinary skill in the art to form the relief portions of Dreisin with a curved surface, as taught by Pitner, as a matter of engineering expediency.

Claims 3 and 8 do not meet an inventive step under PCT Article 33(3) as being obvious over Dreisin in view of Rosen et al and Pitner, as applied in the above discussion, and further in view of Tool Engineers Handbook. The modified Dreisin discloses all of the elements of claim 3, except that there is no surface coating applied to the connecting rod bore.

Tool Engineers Handbook teaches, that a surface coating can be applied to a metal surface (e.g. chromium directly over steel), for the purpose of improving hardness and wear qualities (page 1228, last paragraph).

Since the connecting rod bore of the modified Dreisin forms a bearing surface for the piston pin, and since bearing surfaces need to have good hardness and wear qualities; it would have been obvious at the time the invention was made to one having ordinary skill in the art to apply a surface coating to the connecting rod bore of Dreisin, as taught by Tool Engineers Handbook, for the purpose of improving hardness and wear qualities.

Claims 4, 5, 9 and 10 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest the profiled relief portions are each shaped with a plurality of end-to-end frustoconical sections.

----- NEW CITATIONS -----

US 3,424,138 A (DREISIN) 28 JANUARY 1969, ENTIRE DOCUMENT

US 2,483,674 A (ROSEN ET AL) 04 OCTOBER 1949, ENTIRE DOCUMENT

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

WRITTEN OPINION

(PCT Rule 66)

To: TROY J. COLE
WOODARD, EMHARDT, NAUGHTON, MORIARTY
AND MCNETT
BANK ONE CENTER/TOWER
111 MONUMENT CIRCLE, SUITE 3700
INDIANAPOLIS, INDIANA 46204

Date of Mailing
(day/month/year)

20 NOV 2000

Applicant's or agent's file reference

5031D2116

REPLY DUE

within TWO months
from the above date of mailing

International application No.

PCT/US99/29395

International filing date (day/month/year)

10 DECEMBER 1999

Priority date (day/month/year)

11 DECEMBER 1998

International Patent Classification (IPC) or both national classification and IPC
IPC(7): F16J 1/16 and US Cl.: 92/187, 222

Applicant

CUMMINS ENGINE COMPANY, INC.

1. This written opinion is the first (first, etc.) drawn by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. ~~The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).~~

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4. For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis. For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 11 APRIL 2001

Name and mailing address of the IPEA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

F. DANIEL LOPEZ

Telephone No. (703) 308-0008

WRITTEN OPINION

International application No.

PCT/US99/29395

I. Basis of the opinion

1. With regard to the **elements** of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
 pages 1-11 , as originally filed
 pages NONE , filed with the demand
 pages NONE , filed with the letter of _____
- ☒ the claims:
 pages 12 , as originally filed
 pages 13-13/2 , as amended (together with any statement) under Article 19
 pages NONE , filed with the demand
 pages NONE , filed with the letter of _____
- ☒ the drawings:
 pages 1-8 , as originally filed
 pages NONE , filed with the demand
 pages NONE , filed with the letter of _____
- ☒ the sequence listing part of the description:
 pages NONE , as originally filed
 pages NONE , filed with the demand
 pages NONE , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form. *
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

- ☒ the description, pages NONE
- ☒ the claims, Nos. NONE
- ☒ the drawings, sheets/fig NONE

5. ☐ This opinion has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".

WRITTEN OPINION

International application No.
PCT/US99/29395

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been and will not be examined in respect of:

☐ the entire international application.

☒ claims Nos. 11-25

because:

☐ the said international application, or the said claim Nos. _ relate to the following subject matter which does not require international preliminary examination (*specify*).

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. _ are so unclear that no meaningful opinion could be formed (*specify*).

☐ the claims, or said claims Nos. _ are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for said claims Nos. 11-25.

2. A written opinion cannot be drawn due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

WRITTEN OPINION

International application No.

PCT/US99/29395

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. statement

Novelty (N)

Claims 2-5, 7-10 YES
Claims 1, 6 NO

Inventive Step (IS)

Claims 4, 5, 9, 10 YES
Claims 1-3, 6-8 NO

Industrial Applicability (IA)

Claims 1-10 YES
Claims NONE NO

2. citations and explanations

Claims 1 and 6 lack novelty under PCT Article 33(2) as being anticipated by Cuddon-Fletcher et al. Cuddon-Fletcher et al discloses a frustoconical profiled relief portion at each end of a connecting rod bore (for assisting in aligning and sliding a piston pin through)

Claims 1, 2, 6 and 7 do not meet an inventive step under PCT Article 33(3) as being obvious over Dreisin in view of Rosen et al and Pitner. Dreisin discloses an engine cylinder piston-connecting rod sub-assembly comprising a connecting rod (6) having a piston end portion assembled into a piston (4) and defining a connecting rod bore, extending between opposite first and second ends, for receiving a piston pin (7); wherein the piston pin is inserted through the connecting rod bore and portions of the piston for securing the piston to the connecting rod; and wherein the piston pin rotates relative to the connecting rod bore (e.g. column 2 line 31-33); but does not disclose that the connecting rod bore is shaped with first and second profiled relief portions adjacent respective first and second ends, each profiled relief portion has a curved surface.

Rosen et al teaches, for an engine cylinder piston- connecting rod sub-assembly comprising a connecting rod (14) having a piston end portion assembled into a piston (10, 11) and defining a connecting rod bore, extending between opposite first and second ends, for receiving a piston pin (13); wherein the piston pin is inserted through the connecting rod bore and bores in portions (e.g. 12) of the piston for securing the piston to the connecting rod; wherein each of the bores in the piston has a first end; that the first ends of each of the bores of the piston has a profiled relief portion (44), for the purpose of eliminating stress concentrations at the first end of each of the piston bores caused by deformation of the piston pin (e.g. column 3 line 59-64).

Pitner teaches, for a piston-connecting rod sub-assembly comprising a connecting rod (5) having a piston end portion assembled into a piston (2) and defining a connecting rod bore (e.g. 15) ; and a piston pin (3) inserted through the (Continued on Supplemental Sheet.)

WRITTEN OPINION

International application No.

PCT/US99/29395

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 1 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because the claim is indefinite for the following reason(s): in line 10 "a piston pin" should be --said piston pin--, since it refers back to that of line 5.

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

TIME LIMIT:

The time limit set for response to a Written Opinion may not be extended. 37 CFR 1.484(d). Any response received after the expiration of the time limit set in the Written Opinion will not be considered in preparing the International Preliminary Examination Report.

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):

connecting rod bore and bores in portions of the piston for securing the piston to the connecting rod, with a bearing between either the bore and piston pin or a bearing between each of the piston bores and the piston pin; that there is a space between one of the bores and an adjacent portion of the pin, which form first and second profiled curved relief portions adjacent respective first and second ends of the one bore; for the purpose of accommodating deviations of the piston pin under normal load, such that the load is spread out over the full bore and not concentrated at the first and second ends (e.g. column 1 line 31-38, 61-68); that the profiled relief portions are between the piston pin and the piston bores when the piston pin rotates relative to the piston bores and is between the piston pin and connecting rod bore when the piston pin rotates relative to the connecting rod bore (column 2 line 14-24); and that the first and second profiled relief portions can be formed in either the piston pin or the bearing.

Since Rosen et al teaches that stress concentrations are a problem for a bore, which accepts a piston pin which deforms under normal load; since Pitner teaches that piston pin deformation is a problem between the piston pin and either the connecting rod bore or the piston bores, depending on relative rotational movement between the piston pin and the associated bore; and since the piston pin of Dreisin rotates with respect to the connecting rod bore; it would have been obvious at the time the invention was made to one having ordinary skill in the art to shape the connecting rod bore of Dreisin with relief portions adjacent each of the first and second ends, as taught by Pitner and Rosen et al, for the purpose of having the relief portions eliminate stress concentrations caused by deformation of the piston pin under normal load.

It would have been obvious at the time the invention was made to one having ordinary skill in the art to form the relief portions of Dreisin with a curved surface, as taught by Pitner, as a matter of engineering expediency.

Claims 3 and 8 do not meet an inventive step under PCT Article 33(3) as being obvious over Dreisin in view of Rosen et al and Pitner, as applied in the above discussion, and further in view of Tool Engineers Handbook. The modified Dreisin discloses all of the elements of claim 3, except that there is no surface coating applied to the connecting rod bore.

Tool Engineers Handbook teaches, that a surface coating can be applied to a metal surface (e.g. chromium directly over steel), for the purpose of improving hardness and wear qualities (page 1228, last paragraph).

Since the connecting rod bore of the modified Dreisin forms a bearing surface for the piston pin, and since bearing surfaces need to have good hardness and wear qualities; it would have been obvious at the time the invention was made to one having ordinary skill in the art to apply a surface coating to the connecting rod bore of Dreisin, as taught by Tool Engineers Handbook, for the purpose of improving hardness and wear qualities.

Claims 4, 5, 9 and 10 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest the profiled relief portions are each shaped with a plurality of end-to-end frustoconical sections.

----- NEW CITATIONS -----

US 3,424,138 A (DREISIN) 28 JANUARY 1969, ENTIRE DOCUMENT

US 2,483,674 A (ROSEN ET AL) 04 OCTOBER 1949, ENTIRE DOCUMENT

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C. 20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 24 August 2000 (24.08.00)	
International application No. PCT/US99/29395	Applicant's or agent's file reference 503ID2116
International filing date (day/month/year) 10 December 1999 (10.12.99)	Priority date (day/month/year) 11 December 1998 (11.12.98)
Applicant LUEHRMANN, Mark, G. et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

20 June 2000 (20.06.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Henrik Nyberg

Telephone No.: (41-22) 338.83.38

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29395

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : F16J 1/16

US CL : 92/187, 222

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 92/187, 222

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,291,614 A (MOLLE ET AL) 29 SEPTEMBER 1981, ENTIRE DOCUMENT	1-10
Y	US 3,161,185 A (JUSTINIEN ET AL) 15 DECEMBER 1964, ENTIRE DOCUMENT	1-10
Y	US 2,703,264 A (PITNER) 01 MARCH 1955, ENTIRE DOCUMENT	1-10
Y	US 3,994,054 A (CUDDON-FLETCHER ET AL) 30 NOVEMBER 1976, ENTIRE DOCUMENT	4, 9
Y	TOOL ENGINEERS HANDBOOK, 1949, MCGRAW-HILL BOOK COMPANY, PAGES 1228-1229	3, 5, 8, 10
A	US 5,628,577 A (RIBEIRO ET AL) 13 MAY 1997, ENTIRE DOCUMENT	1-10

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

Special categories of cited documents:		*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A	document defining the general state of the art which is not considered to be of particular relevance		
*E	earlier document published on or after the international filing date	*X	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*L	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Y	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*O	document referring to an oral disclosure, use, exhibition or other means		
*P	document published prior to the international filing date but later than the priority date claimed	*&	document member of the same patent family

Date of the actual completion of the international search

13 MARCH 2000

Date of mailing of the international search report

05 APR 2000

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

F. DANIEL LOPEZ

Telephone No. (703) 308-0008

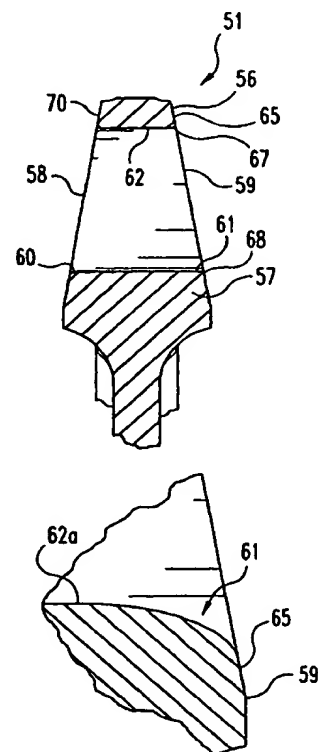


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : F16J 1/16	A1	(11) International Publication Number: WO 00/34696 (43) International Publication Date: 15 June 2000 (15.06.00)
(21) International Application Number: PCT/US99/29395 (22) International Filing Date: 10 December 1999 (10.12.99) (30) Priority Data: 09/210,001 11 December 1998 (11.12.98) US (63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Application US 09/210,001 (CIP) Filed on 11 December 1998 (11.12.98) (71) Applicant (for all designated States except US): CUMMINS ENGINE COMPANY, INC. [US/US]; 500 Jackson Street, Columbus, IN 47201 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): LUEHRMANN, Mark, G. [US/US]; 3243 North Meadow Drive, Hope, IN 47246 (US). RUPP, Mary, E. [US/US]; 9223 South State Road 3, Greensburg, IN 47240 (US). O'LEARY, Mark, D. [US/US]; 9477 West County Road 25 East, Seymour, IN 47274 (US). PIRANER, Ilya, L. [US/US]; 6064 Acorn Drive, Columbus, IN 47201 (US). MILLER, John, M. [US/US]; 4235 Sharp Lane, Columbus, IN 47201 (US). MCNULTY, William, D.		[US/US]; 7620 North County Road 400 West, Scipio, IN 47273 (US). KLEPSE, Cheryl [US/US]; 3282 N. Meadow Drive, Hope, IN 47246 (US). (74) Agents: COLE, Troy, J. et al.; Woodard, Emhardt, Naughton, Moriarty & McNett, Suite 3700, Bank One Center/Tower, 111 Monument Circle, Indianapolis, IN 46204 (US). (81) Designated States: BR, MX, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: CONNECTING ROD WITH PROFILED BORE FOR INCREASED LOAD CAPABILITY**(57) Abstract**

An engine cylinder piston connecting rod subassembly, for use in an engine, includes a piston (53), a piston pin (52) and a connecting rod (51). The connecting rod has a piston end portion with a piston pin bore (62). The piston pin is inserted through the piston pin bore and oppositely disposed portions of the piston, for securing the piston and the connecting rod together. Opposite ends of the piston pin bore are machined or profiled with relief portions (60, 61), to allow for piston pin deflection and thereby maximize the load carrying capacity, by providing a greater area of contact. The relief portions can be a curved surface (65) machined as part of the bore, or a plurality of end-to-end angled frustoconical surfaces (66a, 66b, 66c). The relief portions are shaped to correspond to the shape of the corresponding piston pin when under load during normal engine operation.

**A**

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
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BF	Burkina Faso	GR	Greece			TR	Turkey
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BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
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CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
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CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
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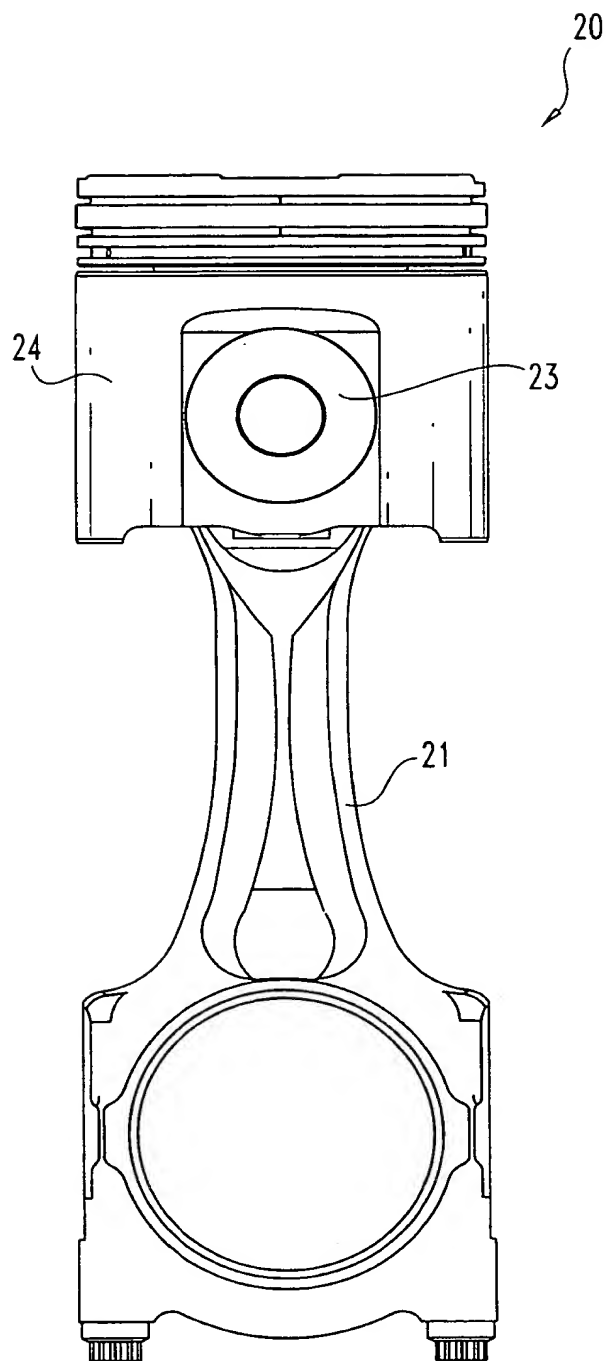
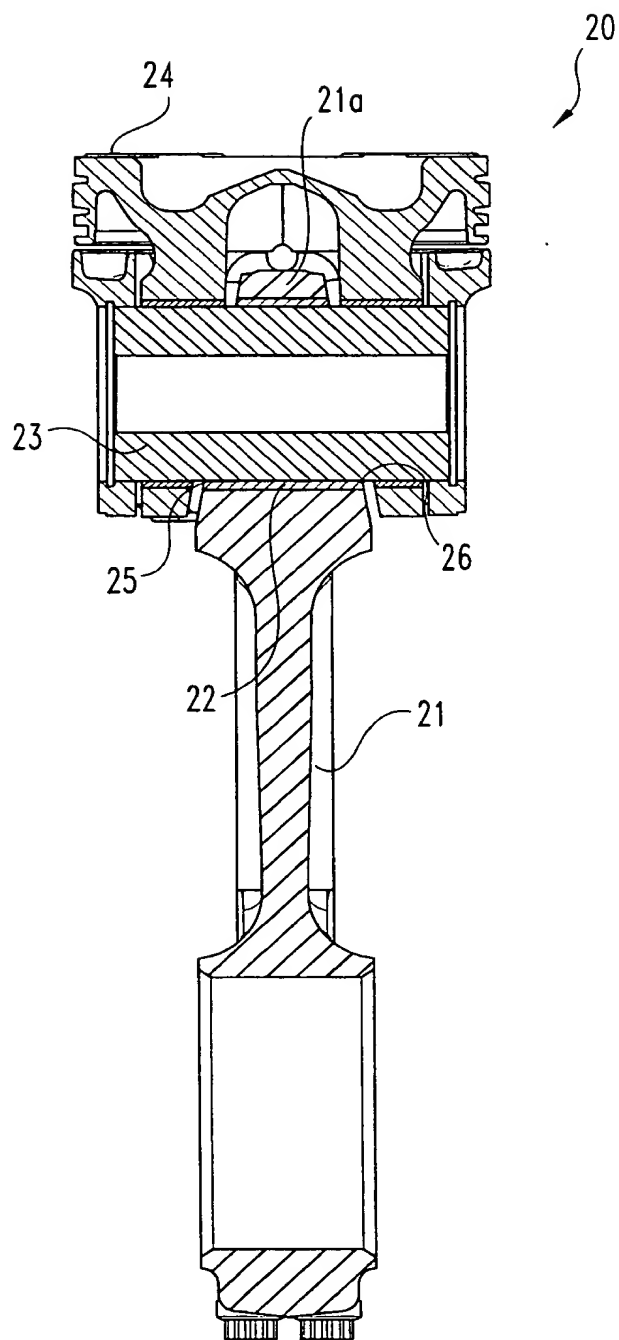
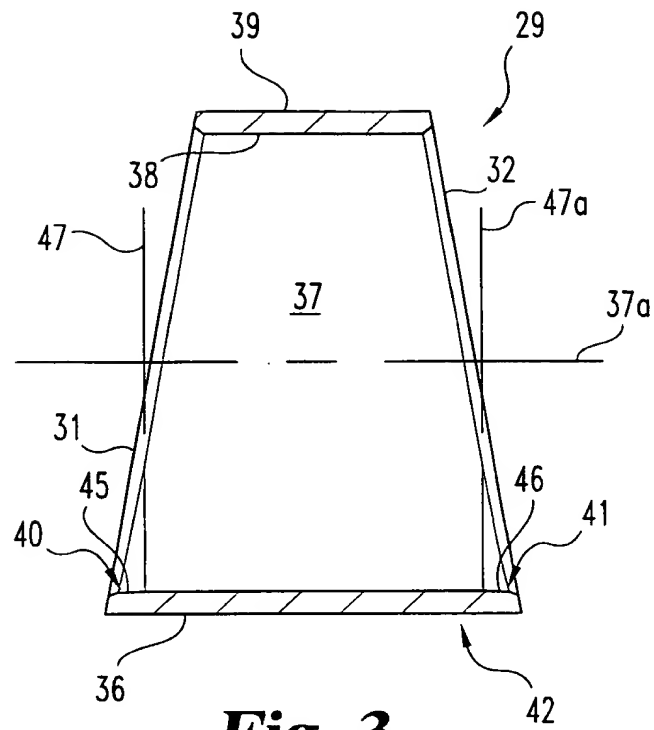
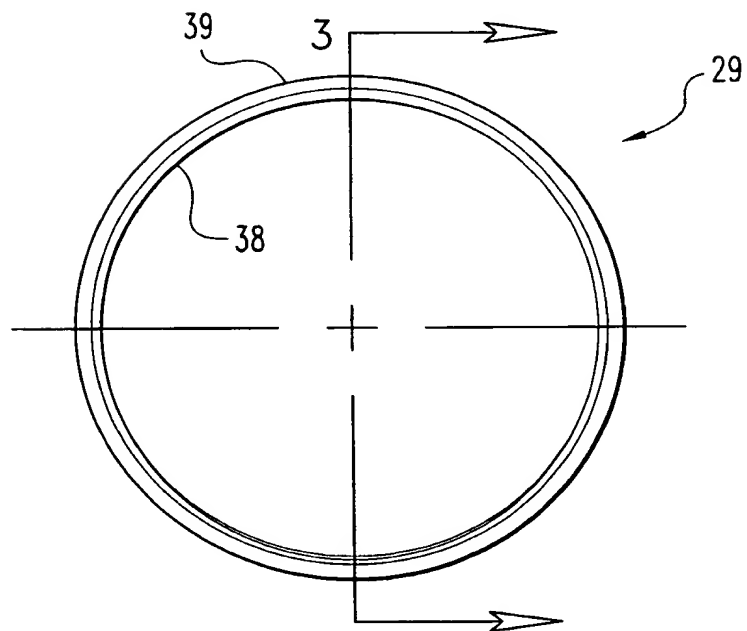


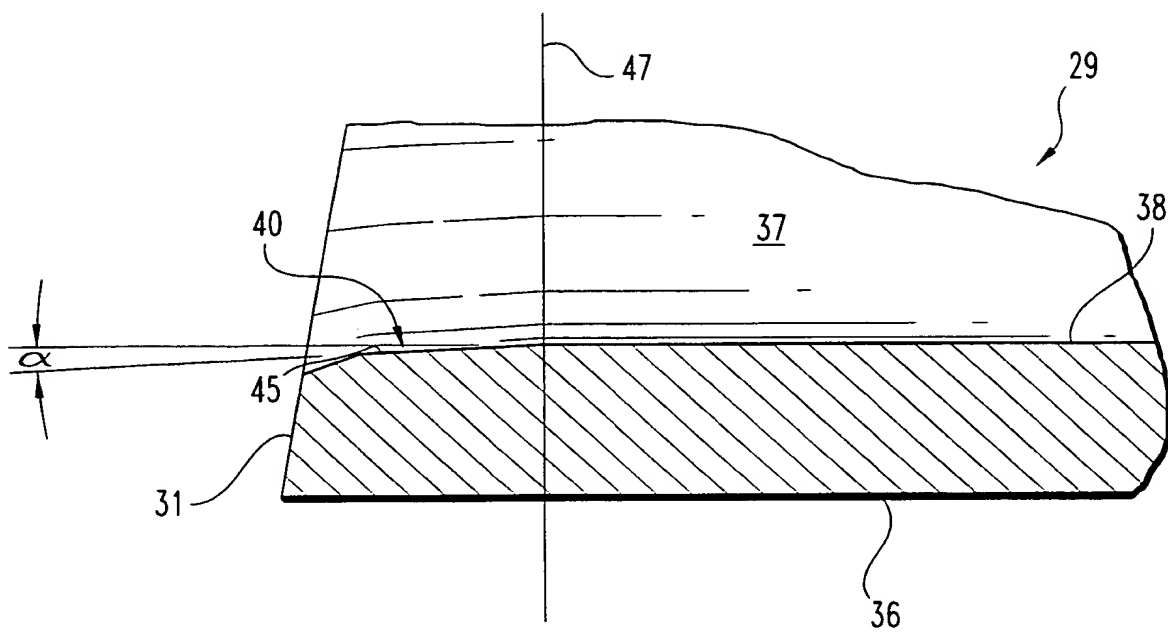
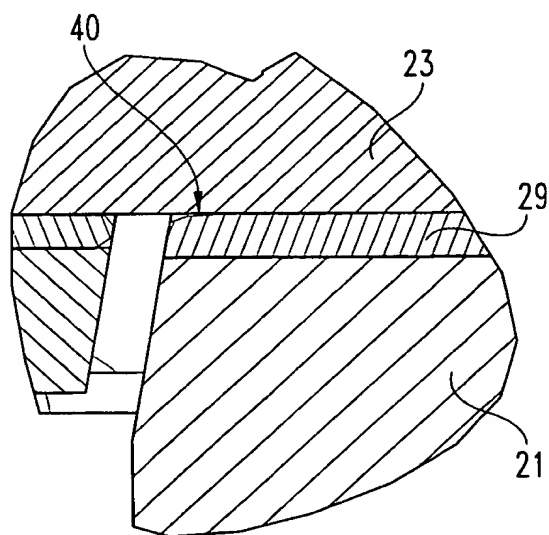
Fig. 1

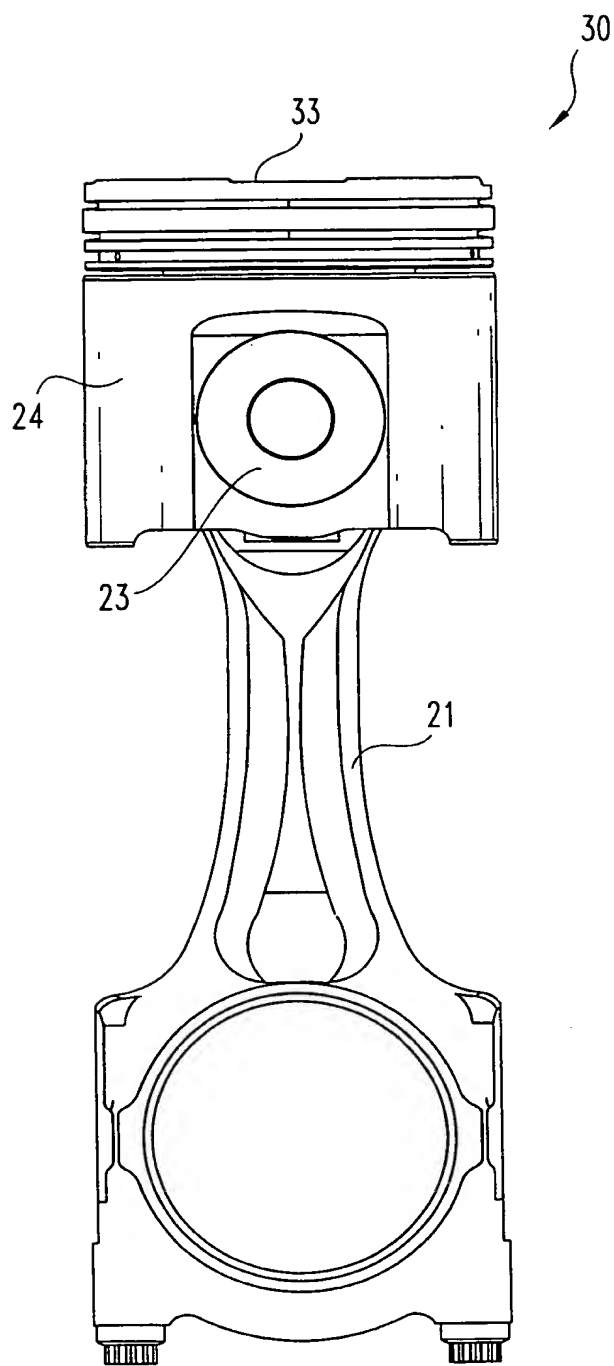
(PRIOR ART)

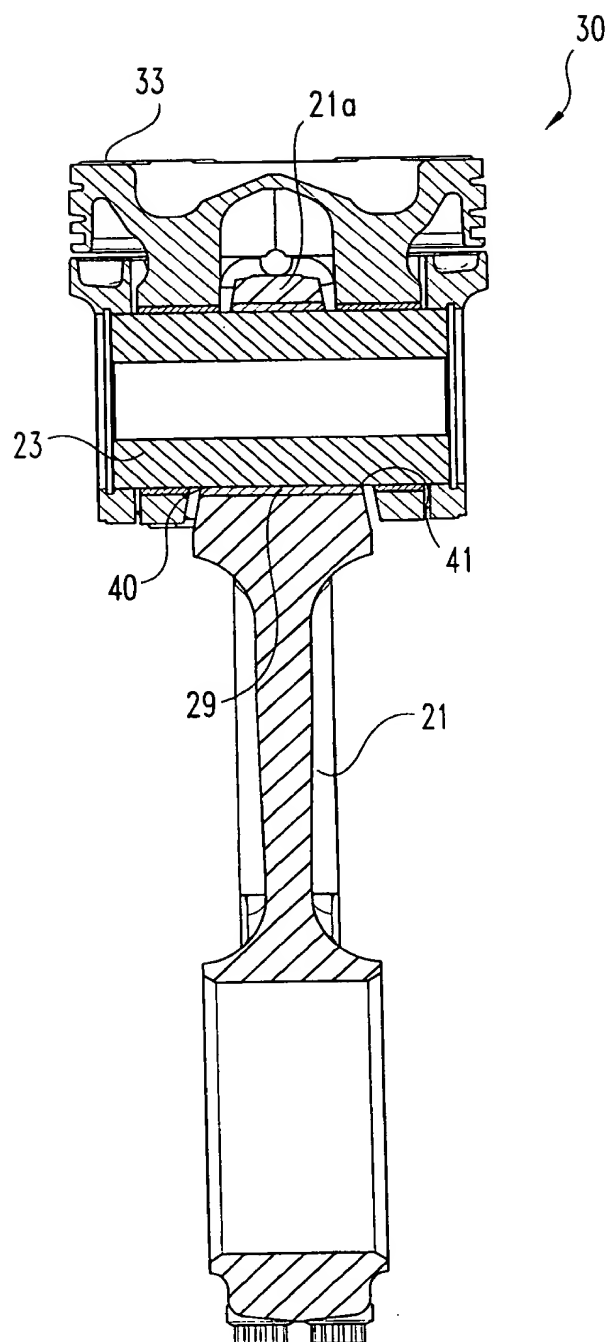
**Fig. 2**

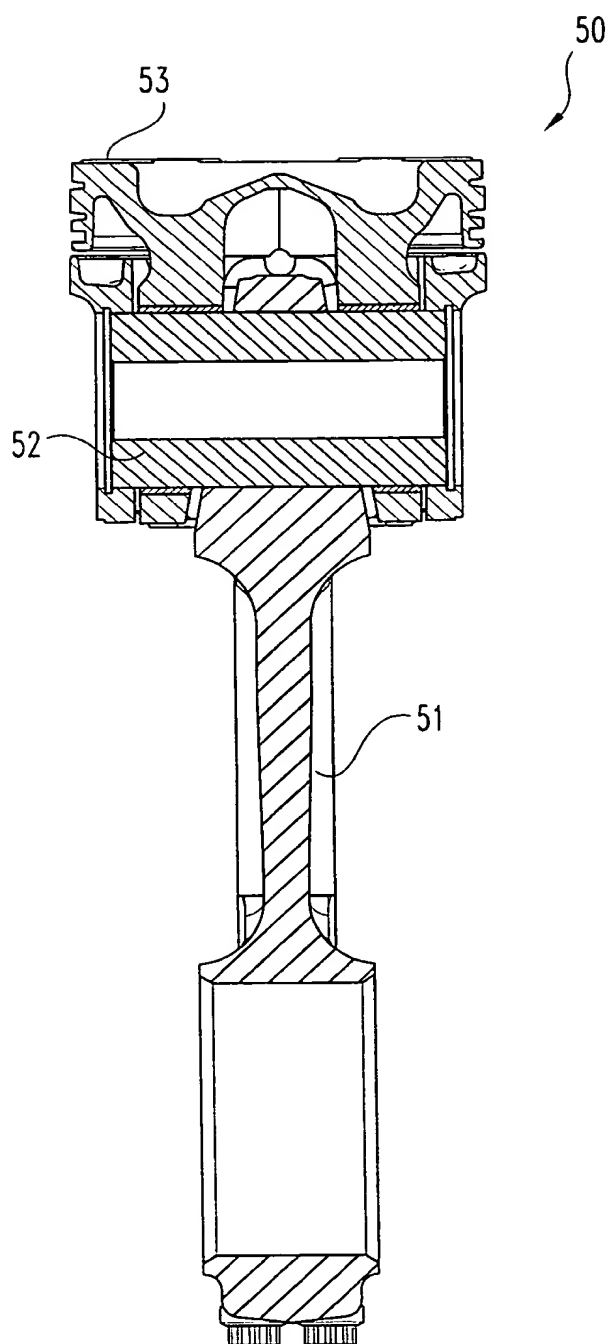
(PRIOR ART)

**Fig. 3****Fig. 4**

**Fig. 5****Fig. 8**

**Fig. 6**

**Fig. 7**

**Fig. 9**

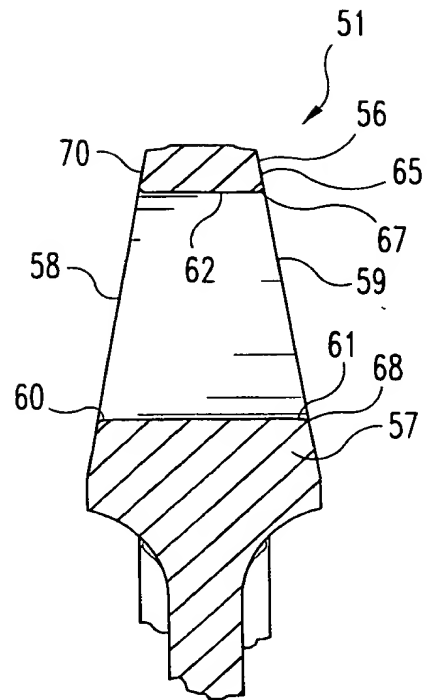


Fig. 10

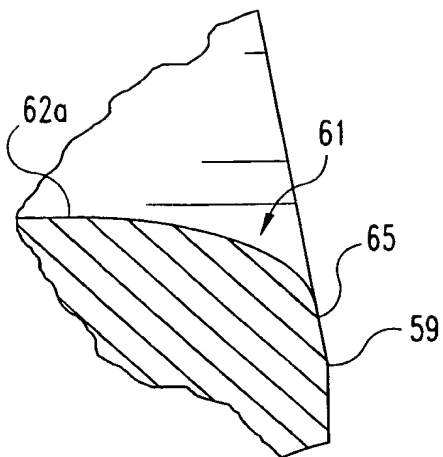


Fig. 11A

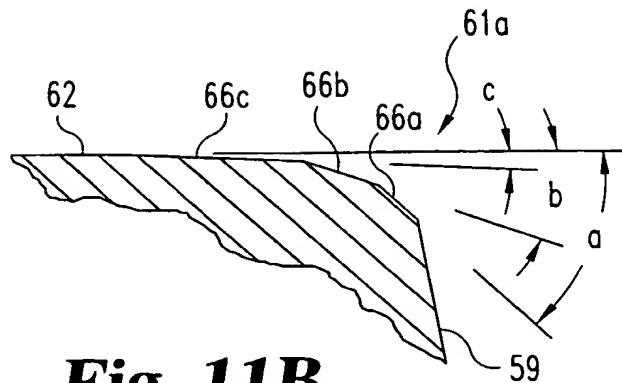


Fig. 11B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29395

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : F16J 1/16
US CL : 92/187, 222

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 92/187, 222

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,291,614 A (MOLLE ET AL) 29 SEPTEMBER 1981, ENTIRE DOCUMENT	1-10
Y	US 3,161,185 A (JUSTINIEN ET AL) 15 DECEMBER 1964, ENTIRE DOCUMENT	1-10
Y	US 2,703,264 A (PITNER) 01 MARCH 1955, ENTIRE DOCUMENT	1-10
Y	US 3,994,054 A (CUDDON-FLETCHER ET AL) 30 NOVEMBER 1976, ENTIRE DOCUMENT	4, 9
Y	TOOL ENGINEERS HANDBOOK, 1949, MCGRAW-HILL BOOK COMPANY, PAGES 1228-1229	3, 5, 8, 10
A	US 5,628,577 A (RIBEIRO ET AL) 13 MAY 1997, ENTIRE DOCUMENT	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

&

document member of the same patent family

Date of the actual completion of the international search

13 MARCH 2000

Date of mailing of the international search report

05 APR 2000

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

F. DANIEL LOPEZ

Telephone No. (703) 308-0008

09/856745

IN THE INTERNATIONAL BUREAU OF WIPO PCT/PTO 2 5 MAY 2001

In re PCT application of)	
CUMMINS ENGINE COMPANY, INC.)	
	)	Authorized Officer:
	)	F. Daniel Lopez
International Application)	
Number PCT/US99/29395	)	Mailing Date
	)	24 May 2000
International Filing Date)	
10 December 1999	)	Agent's File
	)	Reference:
Title of Invention	)	5031D2116
CONNECTING ROD WITH PROFILED)	
BORE FOR INCREASED LOAD)	
CAPABILITY)	

RESPONSE TO THE INTERNATIONAL SEARCH REPORT

The International Bureau
WIPO
34, chemin des Colombettes
1211 Geneva 20
Switzerland

Dear Sir/Madam:

In response to the International Search Report mailed 05 April 2000, regarding the above-referenced PCT Patent Application, the Applicant submits replacement pages 13/1-13/3, adding new claims 11-25. The remainder of the claims are unchanged.

REMARKS

With regard to new claims 11-25, and after consideration of the some of the references cited in the Search Report, the following points are to be noted.

Ribeiro et al. discloses a piston-connecting rod subassembly comprising a connecting rod (30) having a piston end portion assembled into a piston (10) and defining a bushing bore; a sliding means (51) assembled into the bushing bore, the bushing defining a profiled pin bore and having opposite ends; and a piston pin (42) inserted through the pin bore and portions of the piston for securing the piston to the connecting rod. Ribeiro et al. does not disclose that the profiled pin bore is shaped with angled relief portions adjacent each end, angled relative to a longitudinal centerline of the bushing, and that the angled relief portions are designed to reduce stress concentrations on the edges of the bushing or on the edges of the bore as would be the case for the embodiment of claims 1-10.

Pitner discloses a piston (2) defining a bearing bore (15) with a connecting rod bearing (14) defining a profiled pin bore. The piston pin (3) is described as being inserted through the pin bore and that there is a space between the profiled pin bore and the adjacent portion of the pin which increases as each outer end is approached. This space is created by angled relief portions on opposite ends of either the pin or the bearing. It is assumed that the angled relief portions are shaped to correspond to the adjacent portion of the pin under normal load, thereby supporting the load by the full bearing when under normal load.

If there is going to be a suggestion that it would be obvious to combine the Ribeiro et al. and Pitner references, Applicant disagrees. There is virtually nothing mentioned in Ribeiro et al. regarding sliding means (51) as this is of little or no interest relative to the claimed invention. Rather, the focus of the Ribeiro et al. patent is directed to the construction and configuration of the wrist pin (40) and in particular the contouring of the opposite ends of the wrist pin (40). From this it is hard to imagine that there is any "teaching" regarding the sliding means (51), much less any concern or suggestion as to a need to shape or configure the sliding means (51) in any manner. A careful review of the Ribeiro et al. patent does not disclose any profiling of the "sliding means" (51), a fact reinforced by the focus of the Ribeiro et al. patent on the configuration of the ends of wrist pin (40).

As for the Pitner reference, the FIG. 2 and FIG. 3 illustrations show contouring (11) of a portion of the cylinder (3) for a needle (9) to act against. In FIGS. 4 and 5, the needles (9) are shifted from a position interior to the connecting rod to locations which are external to the connecting rod. Even at these remote locations, which are external to the connecting rod, the contouring is to the ends of the cylinder (3) which is functionally equivalent to the piston pin.

While the FIG. 8 configuration switches the contouring (11) location from the ends of the cylinder (3) to the rings (14), this contouring is still at a location which is external to the connecting rod (5). It is also important to note that whatever load or bending accommodation is provided by the surface contouring (11) or profiling of the ends or end surfaces, it is an accommodation for the individual bearing needles (9), not for the pin. Consequently, whatever might be learned from the Pitner patent, it is limited to profiling of a non-connecting rod surface in order to accommodate deflection of a needle or needles of a needle bearing assembly.

As is clearly recited in independent claim 11, the profiling of the pin bore is done to the connecting rod bushing and this particular component is defined as being assembled into the bushing bore of the connecting rod. These claim limitations specifically define where the connecting rod bushing is located and clearly define exactly what portions and surfaces receive the profiling. Neither Ribeiro et al. nor Pitner disclose a similar structure.

Respectfully submitted

By James M. Durlacher
James M. Durlacher, #28,840
Woodard, Emhardt, Naughton,
Moriarty & McNett
Bank One Center/Tower, Suite 3700
111 Monument Circle
Indianapolis, Indiana 46204 US
(317) 634-3456

88581

Enclosures: Pages 13/1-13/3

a second shaped relief portion adjacent said second end, said second shaped relief portion being defined by said main body portion and comprising a portion of said bore.

5 7. The connecting rod of claim 6 wherein said first shaped relief portion and said second shaped relief portion each have a curved surface.

8. The connecting rod of claim 7 wherein a surface coating is applied to said bore.

10 9. The connecting rod of claim 6 wherein said first profiled relief portion and said second profiled relief portion are each shaped with a plurality of end-to-end frustoconical sections.

10. The connecting rod of claim 9 wherein a surface coating is applied to said bore.

15 11. An engine cylinder piston-connecting rod subassembly for use in an engine comprising:
a piston;
a connecting rod having a piston-end portion which is assembled into said piston, said piston-end portion defining a bushing bore;
a connecting rod bushing having oppositely disposed ends and being assembled into said bushing bore, said connecting rod bushing defining a profiled pin bore
20 which is shaped with a relief portion adjacent each end; and
a piston pin inserted through said profiled pin bore and into portions of said piston for securing together said piston and said connecting rod.

25 12. The engine cylinder piston-connecting rod subassembly of claim 11 wherein said connecting rod bushing has a longitudinal centerline and the ends are angled relative to said longitudinal centerline.

13. The engine cylinder piston-connecting rod subassembly of claim 12 wherein said connecting rod bushing is fabricated out of a steel-backed base metal having a composition by weight of 80% Cu, 10% Sn, and 10% Pb.

14. The engine cylinder piston-connecting rod subassembly of claim 13 wherein each relief portion is angled and machined to an angle of between 12 minutes and 32 minutes relative to said bushing bore.

5 15. The engine cylinder piston-connecting rod subassembly of claim 14 wherein each angled relief portion is shaped so as to correspond to the shape of the portion of the piston pin adjacent to the corresponding angled relief portion when the piston pin is under load during normal engine operation.

10 16. The engine cylinder piston-connecting rod subassembly of claim 11 wherein said connecting rod bushing is fabricated out of a steel-backed base metal having a composition by weight of 80% Cu, 10% Sn, and 10% Pb.

17. The engine cylinder piston-connecting rod subassembly of claim 11 wherein each relief portion is angled and machined to an angle of between 12 minutes and 32 minutes relative to said bushing bore.

15 18. The engine cylinder piston-connecting rod subassembly of claim 11 wherein each relief portion is shaped so as to correspond to the shape of the portion of the piston pin adjacent to the corresponding relief portion when the piston pin is under load during normal engine operation.

20 19. The engine cylinder piston-connecting rod subassembly of claim 18 wherein said connecting rod bushing is fabricated out of a steel-backed base metal having a composition by weight of 80% Cu, 10% Sn, and 10% Pb.

20. A connecting rod bushing for use in an engine cylinder piston-connecting rod subassembly and for receipt of a cylindrical piston pin as part of said subassembly, said connecting rod bushing comprising:

25 a substantially cylindrical outer surface, an inner surface, a profiled pin bore with a longitudinal centerline, oppositely disposed ends which are angled relative to said longitudinal centerline and converging in a first direction;

a first shaped relief portion adjacent a first end, said first shaped relief portion being defined by said inner surface and comprising a portion of the profiled pin bore; and

a second shaped relief portion adjacent the other end, said second shaped relief portion being defined by said inner surface and comprising a portion of the profiled pin bore.

5 21. The connecting rod bushing of claim 20 wherein said connecting rod bushing is fabricated out of a steel-backed base metal having a composition by weight of 80% Cu, 10% Sn, and 10% Pb.

 22. The connecting rod bushing of claim 21 wherein each shaped relief portion is machined to an angle of between 12 minutes and 32 minutes relative to said bushing bore.

10 23. The connecting rod bushing of claim 22 wherein each shaped relief portion is configured so as to correspond to the shape of the portion of the piston pin adjacent to the corresponding shaped relief portion when the piston pin is under load during normal engine operation.

15 24. The connecting rod bushing of claim 20 wherein each shaped relief portion is machined to an angle of between 12 minutes and 32 minutes relative to said bushing bore.

20 25. The connecting rod bushing of claim 20 wherein each shaped relief portion is configured so as to correspond to the shape of the portion of the piston pin adjacent to the corresponding shaped relief portion when the piston pin is under load during normal engine operation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PCT application of CUMMINS ENGINE COMPANY, INC.	) Authorized Officer:) F. Daniel Lopez)))
International Application Number PCT/US99/29395	) Mailing Date) 03 January 2001)
International Filing Date 10 December 1999	) Agent's File) Reference:) 5031D2116)
Title of Invention CONNECTING ROD WITH PROFILED BORE FOR INCREASED LOAD CAPABILITY))))

RESPONSE TO WRITTEN OPINION

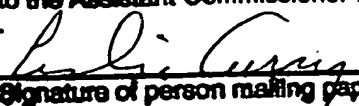
Assistant Commissioner for Patents
Box PCT
Washington, D.C. 20231

Attn: IPEA/US

Dear Sir/Madam:

In response to the Written Opinion mailed 20 November 2000, Applicant's counsel notes that claims 1-10 have been considered while claims 11-25 have not been subject to international preliminary examination due to the fact that no International Search Report was established for claims 11-25.

With regard to claims 1-10, the Written Opinion indicates that with regard to novelty, claims 1 and 6 have received a "NO" indication from the Examiner. With regard to inventive step, claims 1-3 and 6-8 have received a "NO" indication from the Examiner. With regard to industrial applicability, all ten (10) claims have received a "YES" indication from the Examiner.

Express Mail label number EL41447918545
Date of Deposit 03 JANUARY 2001
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37CFR § 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Signature of person making paper or fee

More specifically, the explanations offered by the Examiner indicate that claims 1 and 6 lack novelty as being anticipated by the Cuddon-Fletcher et al. patent. The Examiner contends that this cited reference discloses a frustoconical profiled relief portion at each end of a connecting rod bore. With regard to the claims "rejected" as not meeting the inventive step requirement, the summary indicates claims 1-3 and 6-8. However, only claims 1, 2, 6 and 7 are specifically discussed by the Examiner. Nevertheless, it is believed that the following remarks regarding various deficiencies in the cited references will be sufficient to absolve any possible issues regarding claims 3 and 8 which are not specifically mentioned.

The Examiner has indicated that claims 1, 2, 6, and 7 do not meet the inventive step requirement as being obvious over Dreisin in view of Rosen et al. and Pitner. The Examiner goes on to indicate specifically what portions of each cited reference are relied upon, and these aspects will be discussed in the remarks which follow.

Beginning first with the issue of novelty, claims 1 and 6 both refer to a connecting rod having or defining a bore for receipt of a piston pin. The recited relief portions are part of this piston pin bore. With regard to the cited Cuddon-Fletcher et al. patent, the Examiner suggests that it discloses a frustoconical profiled relief portion at each end of a connecting rod bore. While there is a "bore" which appears to have a chamfered edge (see FIG. 5), this is part of the cylinder crank opening 15 and not part of the piston pin bore 3. It is also argued that simply providing a chamfer on the edge of a bore for the purpose of breaking or removing sharp edges is not the same as specifically shaping and profiling that bore so as to accommodate deflections in a cooperating pin which is under load. It should also be noted that even for the cylinder crank opening 15 which may show some type of a chamfered edge, there does not appear to be any teaching or further disclosure other than what one might infer from the drawing illustration. Even with this disclosure, there is no mention that the wrist pin boss 3 has any similar chamfer to break its sharp edges. While nothing

specific was found in the Cuddon-Fletcher et al. disclosure to support the conclusion of the Examiner, it is also assumed that if there were specific reference numerals or specific illustrations which showed the wrist pin bore having profiled relief areas, that the Written Opinion would have been specific in this regard.

With regard to the issues raised concerning claims 1-3 and 6-8 and the issue of inventive step, three different references have been relied upon by the Examiner. First, the Examiner indicates that Dreisin discloses the basic connecting rod structure, but that it does not disclose that the pin bore is shaped with first and second profiled relief portions. Consequently, the Examiner has found it necessary to combine two other references in order to try and make an obviousness rejection under the inventive step requirement. These two other U.S. patent references are Rosen et al. and Pitner.

With regard to the Rosen et al. patent, the Examiner specifically mentions a "profiled relief portion (44)". However, the portions (44) referred to by the Examiner are actually part of the head and are not located in a connecting rod. Further, the actual patent describes these end portions (44) as being close to the bearing surface and for this reason "may be machined for necessary clearance". The patent goes on to describe the purpose or function of these end portions (44) as being useful "to retain as great a mass of metal under no bearing load as possible in close proximity to the point where cracking originates". As such, there would appear to be very little, if any, structural and functional correlation between what is disclosed in Rosen et al. and the present invention. It is therefore doubtful that any person of ordinary skill would ever think to combine Rosen et al. with Dreisin as the combination of those two references would not yield anything suitable or appropriate along the lines of the present invention.

When we look at the Pitner patent, either as a third patent to the combination of references or in combination directly with Dreisin, we need to consider specifically

what is illustrated. The Examiner makes reference to first and second profiled curved relief portions adjacent first and second ends of the one bore, but there is really nothing specific that would allow Applicant's counsel to understand exactly and precisely what figure and more specifically what reference numerals the Examiner may be referring to. After carefully considering all of the figures of the Pitner patent and upon further review, it does not appear that the pin bore portion of the connecting rod has any type of shaping or profiling. Obviously if Applicant's counsel has overlooked something in this regard, it would be appreciated for the Examiner to make a specific reference as to drawing figure and reference numerals. The text referenced by the Examiner, beginning first with column 1, lines 31-38 and 61-68, appears to be a more general statement and nothing specific is offered as to the profiling of the pin bore of a connecting rod. The same is believed to be true for the reference to column 2, lines 14-24. Even if these portions of text could in some way be interpreted and extrapolated to suggest what the Examiner believes to be the case, it still seems to fall far short of any adequate teaching. There is nothing here which would direct a person of ordinary skill in the art on how to make a combination of this reference with either or both of the other two which have been cited in order to create the claimed invention. Again, it would be very helpful for the Examiner to make a specific reference to the corresponding drawing figure which shows the profiled portions in the pin bore area of the connecting rod.

In view of the remarks which have been provided and in view of the comments relating to the four references cited by the Examiner, claims 1-10 are respectfully requested to be given a "YES" indication as to novelty and a "YES" indication as to inventive step.

Respectfully submitted,

By James M. Durlacher
James M. Durlacher, Reg. No. 28,840
Woodard, Emhardt, Naughton, Moriarty
& McNett
Bank One Center/Tower
111 Monument Circle, Suite 3700
Indianapolis, Indiana 46204-5137
(317) 634-3456

PCT INTERNATIONAL APPLICATION TRANSMITTAL LETTER	DATE: 10 December 1999.
REGARDING THE INTERNATIONAL APPLICATION OF CUMMINS ENGINE COMPANY, INC., et al.	DOCKET OR REFERENCE NUMBER 503ID2116
ENTITLED CONNECTING ROD WITH PROFILED BORE FOR INCREASED LOAD CAPABILITY	

Certification under 37 CFR 1.10 (if applicable)

EL016470069US

10 December 1999

"Express Mail" mailing number

Date of Deposit

I hereby certify that this application is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Linda S.W. Conrad

(Typed or printed name of person
mailing application)

Linda S.W. Conrad
(Signature of person mailing
application)

To the United States Receiving Office (RO/US):

Accompanying this transmittal letter is the above-identified International application, including a completed Request form (PCT/RO/101). Please process the application according to the provisions of the Patent Cooperation Treaty.

The following requests are made of the RO/US:

1. ☒ PREPARATION AND TRANSMITTAL OF CERTIFIED COPY OF PRIORITY DOCUMENTS—Please prepare and transmit to the International Bureau a certified copy of the United States origin priority documents identified in Box VI of the Request form (37 CFR 1.451).

To cover the cost of copy preparation and certification (37 CFR 1.19(a)(3) and (b)(1)).

☒ a (check) (money order) in the amount of \$ 15.00 included is attached to this transmittal letter.

☐ the RO/US is hereby authorized to charge the following deposit account no.: _____

2. ☒ CHOICE OF INTERNATIONAL SEARCHING AUTHORITY—It is requested that the International Search be performed by the following International Searching Authority:

☒ United States Patent and Trademark Office (ISA/US)

☐ European Patent Office (ISA/EP)

The appropriate Search fee for the above-named Authority is indicated on the Fee Calculation Sheet (PCT/RO/101 Annex).

3. ☒ SUPPLEMENTAL SEARCH FEES (ONLY WHEN ISA/US CONDUCTS THE INTERNATIONAL SEARCH.)—Please charge any Supplemental Search fees that may be required by the United States International Searching Authority (ISA/US) to deposit account no.: 23-3030

I understand that this authorization is subject to my oral confirmation thereof in each instance and that it in no way limits my right to submit a protest against payment of the Supplemental Search fees, but is merely an administrative aid to assure that the ISA/US may timely complete the Search Report.

NOTE: SUPPLEMENTAL SEARCH FEES FOR ISA/EP ARE PAYABLE DIRECTLY TO THE EUROPEAN PATENT OFFICE

4. ☒ DISCLOSURE INFORMATION—In order to assist in screening the accompanying International application for purposes of determining whether a license for foreign transmittal should and could be granted and for other purposes, the following information is supplied:

A. ☐ There is no prior filed application relating to this invention.

B. ☒ There is a prior application, serial number 09/210,001 filed on 11 December 1998 which contains subject matter that is -

1. ☐ substantially identical to that of the accompanying International application.

2. ☒ Less than that of the accompanying International application. The additional subject matter of the International application appears on pgs. 8-11 of specification; pgs. 12-13 c claims; and Figs. 9-11E

3. ☐ more than that of the accompanying International application.

C. ☐ Disclosure information cannot be covered by the language of Points 4A or 4B above due to the involvement of several prior applications or for other reasons. A separate sheet on which the disclosure information is explained is attached to this transmittal letter.

5. ☒ REQUEST FOR FOREIGN TRANSMITTAL LICENSE—According to the provisions of 35 U.S.C. 184 and 37 CFR 5.11, a license to transmit the accompanying International application to foreign agencies or international authorities is hereby requested.

SIGNER IS THE

- ☐ APPLICANT
☐ COMMON REPRESENTATIVE
☒ (ATTORNEY) AGENT
REG NO #35,102

NAME OF SIGNER (typed)

Troy J. COLE

SIGNATURE

Troy J. Cole

PCT

FEE CALCULATION SHEET
Annex to the Request

For receiving Office use only

International application No.

Date stamp of the receiving Office

Applicant's or agent's
file reference

503ID2116

Applicant

CUMMINS ENGINE COMPANY, INC., et al.

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE 240 T

2. SEARCH FEE 700 S

International search to be carried out by US
(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

The international application contains 28 sheets.

first 30 sheets 455 b1

remaining sheets x additional amount = b2

Add amounts entered at b1 and b2 and enter total at B 455 B

Designation Fees

The international application contains 4 designations.

4 x 105 = 420 D

number of designation fees payable (maximum 10) amount of designation fee

Add amounts entered at B and D and enter total at I 875 I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT (if applicable) 15 P

5. TOTAL FEES PAYABLE 1830

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

TOTAL

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☒ authorization to charge
deposit account (see below)

☐ bank draft

☐ coupons

☒ cheque

☐ cash

☐ other (specify):

☐ postal money order

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DEPOSIT ACCOUNT AUTHORIZATION (this mode of payment may not be available at all receiving Offices)

The RO/ US ☐ is hereby authorized to charge the total fees indicated above to my deposit account.

☒ (this check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

☐ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

23-3030

10-DEC-1999

Deposit Account No.

Date (day/month/year)

Signature Troy J. COLE, #35,102

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

503ID2116

Box No. I TITLE OF INVENTION

CONNECTING ROD WITH PROFILED BORE FOR INCREASED LOAD CAPABILITY

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

CUMMINS ENGINE COMPANY, INC.
500 Jackson Street
Columbus, Indiana 47201 US

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:
US

State (that is, country) of residence:
US

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

LUEHRMANN, Mark G.
3243 North Meadow Drive
Hope, Indiana 47246 US

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:
US

State (that is, country) of residence:
US

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

COLE, Troy J.
WOODARD, EMHARDT, NAUGHTON, MORIARTY & MCNETT
Bank One Center/Tower, Suite 3700
111 Monument Circle
Indianapolis, Indiana 46204 US

Telephone No.

317-634-3456

Facsimile No.

317-637-7561

Teleprinter No.

SEE CONTINUATION TO BOX NO. IV ON SHEET NO. 5

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
<i>If none of the following sub-boxes is used, this sheet should not be included in the request</i>	
<p>Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i></p> <p>RUPP, Mary E. 9223 South State Road 3 Greensburg, Indiana 47240 US</p>	<p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i></p>
State <i>(that is, country)</i> of nationality: US	State <i>(that is, country)</i> of residence: US
<p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>	
<p>Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i></p> <p>O'LEARY, Mark D. 9477 West County Road 25 East Seymour, Indiana 47274 US</p>	<p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i></p>
State <i>(that is, country)</i> of nationality: US	State <i>(that is, country)</i> of residence: US
<p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>	
<p>Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i></p> <p>PIRANER, Ilya L. 6064 Acorn Drive Columbus, Indiana 47201 US</p>	<p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i></p>
State <i>(that is, country)</i> of nationality: US	State <i>(that is, country)</i> of residence: US
<p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>	
<p>Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i></p> <p>MILLER, John M. 4235 Sharp Lane Columbus, Indiana 47201 US</p>	<p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i></p>
State <i>(that is, country)</i> of nationality: US	State <i>(that is, country)</i> of residence: US
<p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>	
<p><input checked="" type="checkbox"/> Further applicants and/or (further) inventors are indicated on another continuation sheet.</p>	

Continuation of Box No. FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
<i>If none of the following sub-boxes is used, this sheet should not be included in the request.</i>	
<p>Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i></p> <p>MCNULTY, William D. 7620 North County Road 400 West Scipio, Indiana 47273 US</p>	<p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i></p>
State <i>(that is, country)</i> of nationality: US	State <i>(that is, country)</i> of residence: US
<p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>	
<p>Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i></p> <p>KLEPSER, Cheryl 3282 N. Meadow Drive Hope, Indiana 47246 US</p>	<p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i></p>
State <i>(that is, country)</i> of nationality: US	State <i>(that is, country)</i> of residence: US
<p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>	
<p>Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i></p>	<p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i></p>
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
<p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>	
<p>Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i></p>	<p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i></p>
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
<p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>	
<p><input type="checkbox"/> Further applicants and/or (further) inventors are indicated on another continuation sheet.</p>	

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes: at least one must be marked):

Regional Patent

- ☐ **AP** ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☐ **EA** Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ **OA** OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input type="checkbox"/> AE United Arab Emirates | <input type="checkbox"/> LR Liberia |
| <input type="checkbox"/> AL Albania | <input type="checkbox"/> LS Lesotho |
| <input type="checkbox"/> AM Armenia | <input type="checkbox"/> LT Lithuania |
| <input type="checkbox"/> AT Austria | <input type="checkbox"/> LU Luxembourg |
| <input type="checkbox"/> AU Australia | <input type="checkbox"/> LV Latvia |
| <input type="checkbox"/> AZ Azerbaijan | <input type="checkbox"/> MA Morocco |
| <input type="checkbox"/> BA Bosnia and Herzegovina | <input type="checkbox"/> MD Republic of Moldova |
| <input type="checkbox"/> BB Barbados | <input type="checkbox"/> MG Madagascar |
| <input type="checkbox"/> BG Bulgaria | <input type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BR Brazil | <input type="checkbox"/> MN Mongolia |
| <input type="checkbox"/> BY Belarus | <input type="checkbox"/> MW Malawi |
| <input type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MX Mexico |
| <input type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input type="checkbox"/> NO Norway |
| <input type="checkbox"/> CN China | <input type="checkbox"/> NZ New Zealand |
| <input type="checkbox"/> CR Costa Rica | <input type="checkbox"/> PL Poland |
| <input type="checkbox"/> CU Cuba | <input type="checkbox"/> PT Portugal |
| <input type="checkbox"/> CZ Czech Republic | <input type="checkbox"/> RO Romania |
| <input type="checkbox"/> DE Germany | <input type="checkbox"/> RU Russian Federation |
| <input type="checkbox"/> DK Denmark | <input type="checkbox"/> SD Sudan |
| <input type="checkbox"/> DM Dominica | <input type="checkbox"/> SE Sweden |
| <input type="checkbox"/> EE Estonia | <input type="checkbox"/> SG Singapore |
| <input type="checkbox"/> ES Spain | <input type="checkbox"/> SI Slovenia |
| <input type="checkbox"/> FI Finland | <input type="checkbox"/> SK Slovakia |
| <input type="checkbox"/> GB United Kingdom | <input type="checkbox"/> SL Sierra Leone |
| <input type="checkbox"/> GD Grenada | <input type="checkbox"/> TJ Tajikistan |
| <input type="checkbox"/> GE Georgia | <input type="checkbox"/> TM Turkmenistan |
| <input type="checkbox"/> GH Ghana | <input type="checkbox"/> TR Turkey |
| <input type="checkbox"/> GM Gambia | <input type="checkbox"/> TT Trinidad and Tobago |
| <input type="checkbox"/> HR Croatia | <input type="checkbox"/> TZ United Republic of Tanzania |
| <input type="checkbox"/> HU Hungary | <input type="checkbox"/> UA Ukraine |
| <input type="checkbox"/> ID Indonesia | <input type="checkbox"/> UG Uganda |
| <input type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> US United States of America |
| <input type="checkbox"/> IN India | Continuation - 10-Part |
| <input type="checkbox"/> IS Iceland | <input type="checkbox"/> UZ Uzbekistan |
| <input type="checkbox"/> JP Japan | <input type="checkbox"/> VN Viet Nam |
| <input type="checkbox"/> KE Kenya | <input type="checkbox"/> YU Yugoslavia |
| <input type="checkbox"/> KG Kyrgyzstan | <input type="checkbox"/> ZA South Africa |
| <input type="checkbox"/> KP Democratic People's Republic of Korea | <input type="checkbox"/> ZW Zimbabwe |
| <input type="checkbox"/> KR Republic of Korea | Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet: |
| <input type="checkbox"/> KZ Kazakhstan | <input type="checkbox"/> |
| <input type="checkbox"/> LC Saint Lucia | <input type="checkbox"/> |
| <input type="checkbox"/> LK Sri Lanka | <input type="checkbox"/> |

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Supplemental Box

Supplemental Box is not used, this sheet should not be included in the request.

1. If, in any of the Boxes, the space is insufficient to furnish all the information: in such case, write "Continuation of Box No. ..." [indicate the number of the Box] and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:
 - (i) if more than two persons are involved as applicants and/or inventors and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;
 - (ii) if, in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;
 - (iii) if, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;
 - (iv) if, in addition to the agent(s) indicated in Box No. IV, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;
 - (v) if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if, in Box No. V, the name of the United States of America is accompanied by an indication "continuation" or "continuation-in-part": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;
 - (vi) if, in Box No. VI, there are more than three earlier applications whose priority is claimed: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI;
 - (vii) if, in Box No. VI, the earlier application is an ARIPO application: in such case, write "Continuation of Box No. VI", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed.
2. If, with regard to the precautionary designation statement contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.
3. If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning non-prejudicial disclosures or exceptions to lack of novelty: in such case, write "Statement concerning non-prejudicial disclosures or exceptions to lack of novelty" and furnish that statement below.

Continuation to Box No. IV Agent

WOODARD, Harold R.; EMHARDT, C. David; NAUGHTON, Joseph A., Jr.; MORIARTY, John V.; McNETT, John C.; HENRY, Thomas Q.; DURLACHER, James M.; REEVES, Charles R.; WAGNER, Vincent O.; ZLATOS, Steve; BEREVESKOS, Spiro; BAHRET, William F.; BROWNING, Clifford W.; FRISK, R. Randall; LUEDERS, Daniel J.; GANDY, Kenneth A.; THOMAS, Timothy N.; SISSELMAN, Kerry P.; JONES, Kurt N.; ALLIE, John H.; BANTA, Holiday W.; COLE, Troy J.; PAYNTER, L. Scott; LOWES, J. Andrew; MEYER, Charles J.; HARRIS, Darrin Wesley; SCHANTZ, Matthew R.; COY, Gregory B.; HIDAY, Lisa A.; DANILUCK, John V.; BROWN, Christopher A.; SCHWARTZ, Jason J.; USHER, Arthur J. IV; COLLIER, Douglas A.; MYERS, James B. Jr.; STEVENS, Scott J., and ROWE, James L., all of Woodard, Emhardt, Naughton, Moriarty & McNett, Bank One Center/Tower, Suite 3700, 111 Monument Circle, Indianapolis, Indiana 46204 United States of America

Continuation to Box No. V

US 09/210,001; 11 December 1998 (11.12.98)

Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) (11.12.98) 11 December 1998	09/210,001	US		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): (1)

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA)
(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year) Number Country (or regional Office)

ISA / US

11 December 1998 (11.12.98) 09/210,001 US

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 6
description (excluding sequence listing part) : 11
claims : 2
abstract : 1
drawings : 8
sequence listing part of description : n/a

Total number of sheets : 28

This international application is accompanied by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney, reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☒ Other (specify): Transmittal Letter (dup)

Figure of the drawings which should accompany the abstract: 9

Language of filing of the international application: English

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Applicant(s):

CUMMINS ENGINE COMPANY, INC.

LUEHRMANN, Mark G.

RUPP, Mary E.

O'LEARY, Mark D.

PIRANER, Ilya L.

MILLER, John M.

MCNULTY, William D. and KLEPSEK, Cheryl

Agent:


(Troy J. COLE)

For receiving Office use only		2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application:		
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA /	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

For International Bureau use only
Date of receipt of the record copy by the International Bureau: